Types of Wave Solder Defects

- Non Wetting
- Dewetting
- Pin Holes
- Webbing
- White Haze
- Solder Balls
- Icycling
- Bridging
- Excess Solder
- Dull/Grainy Joints
- Cold/Disturbed Joints

Non Wetting
Recognized by pull back of solder to expose the surface to be soldered

Non Wetting - Possible Causes:
Grease, oil or dirt on the pre-soldered surface
Bleeding or misregistered soldered mask
Low temperature solder
Contaminated solder
Surfaces too heavily oxidized for flux being used
Contaminated flux
Poor application of flux

Remedy
Investigate each possible cause and correct suspected discrepancies one at a time until solderability is restored
Dewetting
Recognized by metal wetting initially, then pulling back to form droplets of solder on the surface.

Dewetting - possible Causes:
Contamination of surface by abrasives
Poor plating
Poor hot air solder leveling during PCB manufacture

Remedy
Restore solderability of the surface
Pin Holes
Recognized by small holes or eruptions in the solder fillet.

Pin Holes - possible Causes:
- Moisture or plating solution in the PCB laminate
- Inadequate preheat to evaporate flux solvent
- Flux has absorbed water
- Physical blockage due to foreign body in hole
- Top of Plated Through Hole prematurely solidifying

Remedy
- Increase preheat to see if it eliminates problem
- Put in new flux to see if it eliminates problem
- Increase topside preheat and/or solder temperature to correct premature topside Plated Through Hole freezing
- If all of these fail to correct the problem, have the PCBs baked and cross sectioned.
Webbing
Recognized by a spider web like extension of solder across the non conductive portion of the PCB.

Possible Causes:
Improper curing of the laminate or solder mask
Inadequate flux (when accompanied by bridging or icinging)
Dross in the solder wave

Remedy
Baking the PCB will sometimes correct the improperly cured mask or laminate condition
Substituting a more viscous flux or increasing the quantity of flux put on the PCB
Correcting the drossing problem in the wave
White Haze on Solder Mask
Recognized by a white haze on the non-conductive portion of the PCB that cannot be removed by washing.

**White Haze on Solder Mask**

**Possible Causes:**
Improper curing of the laminate or solder mask

**Remedy**
Baking the PCB will sometimes correct the improperly cured mask or laminate condition

**Solder Balls**
Recognized by tiny spherical shapes of solder dispersed over the surface of the PCB

**Possible Causes:**
- Insufficient preheat
- Plated Through Hole conditions that create pin holes, resulting in Solder Balls
- High humidity in the manufacturing area
- Moisture in the flux

**Remedy:**
Investigate each possible cause, correcting suspect causes one at a time until the problem is corrected.
**Icycling**
Recognized by conical or flag shaped extensions of the solder fillet

**Possible Causes:**
Any condition that causes the solder to solidify while in the process of draining, such as:
- inadequate flux to promote quick drainage
- pot temperature too low
- soldering surface unusually heat absorbent
- leads picking up dross in the wave
- wrong Plated Through Hole to wire ratio

**Remedy:**
Investigate each possible cause and correct the suspect conditions one at a time until the problem is eliminated

**Bridging**
Recognized by solder extending from one lead to an adjacent lead, causing a short circuit

**Possible Causes:**
Component leads that are bent or too closely spaced
- Excess solder
- Inadequate flux remains to promote drainage
- Board immersed too deep in the wave
- Leads picking up dross in the wave
- Contaminated solder
- Poor component solderability

**Remedy:**
Investigate each possible cause and correct suspect conditions one at a time until the condition is eliminated
**Excess Solder**

**Recognized by:**
Bulbous appearance of fillet.
Unable to see contours of lead and land.

**Possible Causes:**
- Any condition that contributes to poor drainage of the solder
- Low temperature of solder or preheat
- Contamination of solder
- Insufficient flux to promote drainage
- Incorrect wave exit angle or speed

**Remedy:**
- Investigate suspected causes and correct them one at a time until the problem is corrected

**Dull or Grainy Joints**

**Recognized by:**
Dark, non reflective, rough surfaces from an alloy that is normally bright and shiny.

**Remedies:**
- Determine that the alloy is normally a shiny alloy
- Examine a recent pot analysis or get one done
- Conduct electrical and mechanical evaluation to see if rework is necessary
- If solder meets J-STD-006 Purity Standards and joints are mechanically sound, there is no reason for rejection or touch up
- If solder does not meet standard, it is a cold joint and should be replaced
Cold/Disturbed Solder Joints
Recognized by rough and dull finish on the fillets in conjunction with unacceptable mechanical strength of the joint

Possible Causes:
Movement while joint is still molten caused by:
Conveyor mechanism erratic
Solder Temperature too high

Remedy:
Look for causes of vibration being transmitted to the PCB and correct them
Insure that solder reaches solidus temperature immediately after joint is completed